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(54) [Title of the Invention] Cationic Polymer

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(54) [Title of the Invention] Cationic Polymer

(57) [Abstract]
[PURPOSE]
To provide a novel cationic polymer that forms a complex with an anionic surfactant which is a cleaning agent component, which has an excellent conditioning effect during rinsing, which does not become stiff after drying, and which forms a very soft complex film.

[RESOLUTION MEANS]
The cationic polymer which is a copolymer of (A) a polymeric monomer with a quaternary cation group, and (B) a polymeric monomer containing a polyoxyethylene chain, wherein the nitrogen content in the polymer is between 0.5 and 6 mass% of the total weight of the polymer.

What is claimed is:

[Claim 1]

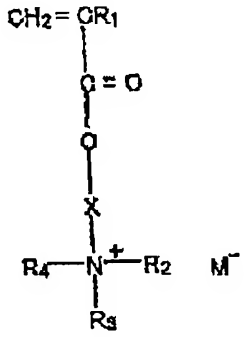
A cationic polymer which is a copolymer of (A) a polymeric monomer containing a quaternary cation group and (B) a polymeric monomer containing a polyoxyethylene chain, wherein the nitrogen content of the polymer is between 0.5 and 6 mass%.

[Claim 2]

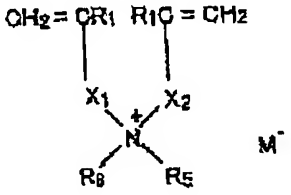
The cationic polymer according to Claim 1, wherein the (A) polymeric monomer containing a quaternary cation group is expressed by following general formula (1) or (2), and the (B) polymeric monomer containing a polyoxyethylene chain is expressed by the following general formula (3).

[Formula 1]

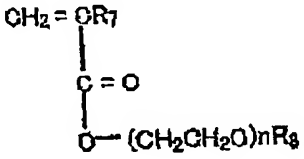
式 (1)



式 (2)



式 (3)



(where in the formulas, R_1 is a hydrogen atom or an alkyl group with between 1 and 4 carbons, R_2 through R_6 are each independent alkyl groups with between 1 and 4 carbons, X_1 and $X_2$are alkylene groups with between 2 and 4 carbons, R_7 is a hydrogen atom or an alkyl group with between 1 and 4 carbons, R_8 is a hydrogen atom, an alkyl group with between 1 and 6 carbons, or an aryl group, and n is between 2 and 50.)

[Claim 3]

A cleaning agent composition containing the cationic polymer shown in Claim 1 or Claim 2.

[Claim 4]

A cosmetic composition containing the cationic polymer shown in Claim 1 or Claim 2.

[Claim 5]

A softening agent composition containing an anionic compound, also containing the cationic polymer shown in Claim 1 or Claim 2.

[Detailed Description of the Invention]
[0001]
[Technical Field of the Invention]
The present invention relates to a novel cationic polymer, and in further detail relates to a cationic polymer which can be used as an active ingredient for a cleaning agent composition, cosmetic material composition, or softening agent composition, or the like.

[Background Technology]
To date, various cationic polymers have been used in cosmetic materials. For instance, cationic cellulose ((Catinal C-100, LC-200, UCARE polymer JR-400, JR-30M, Rheogard GP, LP, MGP, CellcoatSC- 240, SC-230M, H-100, L-200, Quoterisoft [spelling unknown]LM-200) as well as cationized guar gum(Jagar C-318), cationized starch, cationized pullulan, and cationized dextran and the like are known to be semisynthetic cationic polymers which use naturnal polysaccharides.

[0002]
Furthermore, a homopolymer of dimethyldiallylammonium chloride (Mercoat 100), a copolymer of dimethyldiallylammonium chloride and acrylamide (Mercoat 550), a copolymer of dimethyldiallylammonium chloride and acrylic acid (Mercoat 280), a copolymer of vinylimidazolium and vinyl pyrrolidone (Rubicoat FC 370, 550, 905, HM-552), a copolymer of methacrylamidopropyltrimethylammonium halide and vinyl pyrrolidone (Gufcoat HS-100), a dimethyl sulfate quaternary compound of dimethylaminoethyl methacrylate, a dimethyl sulfate quaternary compound of a copolymer of dimethylaminoethyl methacrylate and vinyl pyrrolidone (Gufcoat 755N, 734), and copolymers of methacryloylethyldimethyl betaine and methacryloylethyltrimethyl ammonium chloride, or hydroxymethyl methacrylate and methoxypolyethylene glycol methacrylate (Parasusaizu 440, 450) and the like are known as synthetic cationic polymers. These cationic polymers are widely used to thicken, stabilize dispersions, and maintain the form of cosmetic materials, but in compositions for cleaning the body and hair such as shampoo, body soap, and facial soap, can also provide a conditioning effect during rinsing by forming complexes with the anionic surfactants which are the cleaning components.

[0003]
However, conventional cationic polymers, and particularly synthetic cationic polymers often do not form complexes, depending on the type and composition of the anionic surfactant which is the cleaning agent, as well as the structure of the cationic surfactant, and even if complexes are formed, often have a noticeably poor conditioning effect. Therefore, cationic polymers which have practical application have been restricted to cationized polysaccharides such as cationized cellulose or cationized guar gum, and to synthetic compounds such as the Mercoat series. The complexes formed by these cationic polymers adhere to the hair and skin when the cleaning agent is used, particularly during rinsing, and provide a smooth feel, but have the disadvantage of forming a film and causing a stiff feeling later when dried. The stiff feel which is caused by these complexes hinders the performance and feel during use of rinses, treatments, and hair setting agents, as well as skin lotions, skin creams, body lotions, and body creams and the like, and therefore there is demand for a cationic polymer that has a conditioning effect and which has reduced stiff feel after drying.

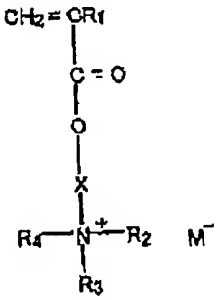
[0004]
[Problem to Be Resolved by the Invention]
An objective of the present invention is to provide a novel cationic polymer that forms a complex with anionic surfactants which are cleaning agent components, and which has excellent conditioning properties during rinsing, and later when dried, is not stiff, and forms a very soft

complex film. An objective of the present invention is also to provide a cleaning agent composition that contains the aforementioned cationic polymer. Another objective of the present invention is to provide a cosmetic material that contains the aforementioned cationic polymer. Yet another objective of the present invention is to provide a softening agent composition that contains the aforementioned cationic polymer.

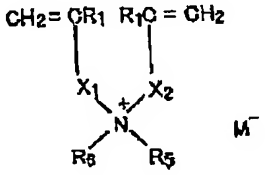
[0005]
[Means for Resolving Problems]
The present invention is a result of repeated investigations concerning the deposition behavior of the complexes between the cationic polymer and an anionic surfactant, as well as the structure of the deposited complexes and the rheology characteristics thereof, and also the drying and hardening properties of those complexes, and is based on findings that the aforementioned problems can be effectively resolved by using a copolymer of repeating units derived from polymeric monomer containing a polyoxyethylene chain and repeating units derived from specific cationic polymeric monomers. In other words, the present invention provides a cationic polymer which is a copolymer of (A) a polymeric monomer containing a quaternary cation group and (B) a polymeric monomer containing a polyoxyethylene chain, wherein the nitrogen content of the polymer is between 0.5 and 6 mass%. The present invention further provides a cleaning agent composition which contains the aforementioned cationic polymer. The present invention further provides a cosmetic material that contains the aforementioned cationic polymer. The present invention further provides a softening agent composition which contains the aforementioned cationic polymer. The aforementioned composition of the present invention preferably contains a complex of the aforementioned cationic polymer and the anionic compound.

[0006]
[Implementation Form of the Invention]
The (A) polymeric monomer containing a quaternary cation group used with the present invention may be a vinyl monomer with at least 1 and preferably with 1 quaternary cation group in a molecule. The (A) polymeric monomer containing a quaternary cation group used in the present invention preferably is a monomer expressed by either one of the following general formulas (1) or (2).
[0007]
[Formula 2]

式 (1)



式 (2)



[0008]
(In the formula, R_1 is a hydrogen atom or an alkyl group with between 1 and 4 carbons, R_2 through R_6 are each independent alkyl groups with between 1 and 4 carbons, X, X_1 and X_2 are each independent alkylene groups with between 2 and 4 carbons, and M is a halide ion, or an anionic counterion such as a sulfate ion or methylsulfate ion.)
In the formula, the alkyl groups may have substitution groups such as hydroxyl groups or halide groups. R_1 preferably is a hydrogen atom or an alkyl group with 1 or 2 carbons, and R_2 through

R_6 are preferably each independent alkyl groups with either 1 or 2 carbons. The two R_1 in general formula (2) can be either the same or different group. Furthermore, with the cationic monomer shown in general formula (1), R_1 is particularly preferably a hydrogen atom or a methyl group, X is an alkylene group with either 2 or 3 carbons, R_2 through $R_4$are particularly preferably methyl or ethyl. M is preferably a halide ion, and more preferably is chloride, or bromide or the like.

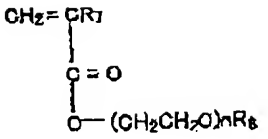
[0009]
Specific examples of the cationic monomer expressed by general formula (1) include ethyltrimethylammonium (meth)acrylate, propyltritrimethyl ammonium (meth)acrylate, butyltrimethyl ammonium (meth)acrylate, ethyltriethyl ammonium (meth)acrylate propyltriethyl ammonium (meth)acrylate, butyltriethyl ammonium (meth)acrylate and the like, but ethyltrimethyl ammonium (meth)acrylate and propyl trimethyl ammonium (meth)acrylate and the like are particularly preferable. With the present invention, a vinyl monomer having at least one and preferably having one tertiary amine group in the molecule may be used in place of the (A) polymeric monomer containing a quaternary cation group, and polymerized with monomer (B), after which the tertiary amino nitrogen in the monomer unit is reacted with a cationizing agent in order to quaternize. Examples of monomers which have tertiary amino groups in the molecule are those where the-$N^+R_2R_3R_4$group in the aforementioned general formula (1) is a -NR_2R_3 group.

[0010]
Specific examples of preferable vinyl monomers which have a tertiary amino group and a molecule include dimethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, dimethylaminobutyl (meth)acrylate, diethylaminoethyl (meth)acrylate, diethylaminopropyl (meth)acrylate, diethylaminobutyl (meth)acrylate, dipropylaminoethyl (meth)acrylate, dipropylaminopropyl (meth)acrylate, dipropylaminodoodle (meth)acrylate and the like, and dimethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, and diethylaminoethyl (meth)acrylate and the like are even more preferable. The quaternizing agent used is preferably a cationizing agent such as a halogenated alkyl ($C_nH_{2n+1}X_3$; n = 1 - 3, X_3 = Br, Cl or I), or a dialkyl sulfate or the like.Specific examples of these cationizing agents include methyl bromide, methyl chloride, methyl iodide, ethyl bromide, ethyl chloride, ethyl iodide, propyl bromide, propyl chloride, propyl iodide, as well as dimethyl sulfate, diethyl sulfate, dipropyl sulfate, and the like, but ethyl bromide, methyl chloride, dimethyl sulfate, and diethyl sulfate and the like are preferable.

[0011]
In this case, 50 mol% or more, preferably 70 mol% or more, of the nitrogen content in the polymer should be quaternized. Furthermore, for the polymeric monomer containing a quaternary cation group shown in general formula (2) that is used in the present invention, X_1 and X_2 in the formula are preferably alkylene groups with either 2 or 3 carbons, but ethylene groups are more preferable, and furthermore, R_5 and R_6 have between 1 and 3 carbons, but are preferably methyl or ethyl groups. M is preferably a halide ion, and more preferably is chloride, bromide or the like. Specific examples include dimethyldiallylammonium halide, diethyldiallylammonium halide, dipropyldiallylammonium halide, and dibutyldiallylammonium halide and the like. Furthermore, examples of the (B) polymeric monomer containing a polyoxyethylene chain used in the present invention are vinyl monomers which have at least one polyoxyethylene chain in the molecule. Herein, a polyoxyethylene chain is preferably one where the number of additional moles of ethylene oxide is between 2 and 50, more preferably between 2 and 30. Examples of the (B) polymeric monomer containing a polyoxyethylene chain are preferably those monomers expressed by the following general formula (3).

[0012]
[Formula 3]

式 (3)



[0013]
(In the formula, R_7 is a hydrogen atom or an alkyl group with between 1 and 4 carbons, or an alkyl group with between 1 and 6 carbons, or an aryl group, and n is between 2 and 50.)
In the formula, the alkyl groups may have substitution groups such as hydroxyl groups or halide groups. R_7 preferably is a hydrogen atom or an alkyl group with 1 or 2 carbons, R_8 is preferably an alkyl group with either 1 or 2 carbons, or a phenyl group, and n is preferably between 2 and 30. In the formula, R_7 is preferably either a hydrogen atom or methyl group, R_8 is preferably either a hydrogen atom, or methyl, ethyl, propyl, or benzyl or the like. The number n of oxyethylene groups is expressed as an integer between 2 and 50, but this may be either a single value, or an average value of values which have a distribution. Specific examples of the monomer from formula (3) include polyoxyethylene glycol (meth)acrylate, methoxypolyethylene glycol (meth)acrylate, ethoxypolyethylene glycol (meth)acrylate, phenoxypolyethylene glycol (meth)acrylate and the like, but methoxypolyethylene glycol (meth)acrylate is preferable.

[0014]
The cationic polymer of the present invention can be obtained by copolymerizing (A) a polymeric monomer containing a quaternary cation group and (B) a polymeric monomer containing a polyoxyethylene chain, such that the content of nitrogen in the polymer is between 0.5 and 6 mass% based on the total weight of the polymer (abbreviated as % below), preferably between 2 and 5%, but other monomers besides monomer (A) and (B) can also be copolymerized to a level no greater than 15% of the total for instance, and preferably no greater than 10% of the total.The (B) polymeric monomer containing a polyoxyethylene chain is preferably a monomer expressed by the following general formula (3). If a monomer which has an anion group is used, the ratio of cation groups to anion groups should not be larger than 7/3, and is preferably no larger than 8/2. The cationic polymer of the present invention preferably has an average molecular weight between 1000 and 1 million, more preferably between 5000 and 1 million, and even more preferably between 10,000 and 500,000. If a polymer within this range is used, the complex which is formed with the anionic surfactant will easily be deposited, excellent conditioning will be achieved, and handling will be improved, both during preparation and during use. In particular, when the final composition is prepared, if the viscosity is favorable, conditioning effects can be achieved during rinsing, and furthermore, a very soft complex film with an excellent finishing feel can be formed after drying, which is a characteristic of the present invention.

[0015]
The cationic polymer of the present invention can be polymerized by various types of commonly known methods, and although not a restriction in particular, the use of solution polymerization or emulsion polymerization is preferable. Furthermore, the copolymerization may be either random or block. The polymerization solvent medium is preferably methanol, ethanol, 2-propanol, or other low-level alcohol, or a low-level ketone such as acetone, used individually or as a solvent blend, or as a solvent blend with water. The water content in the solvent medium if a solvent blend which contains water is used is preferably between 10 and 50%, more preferably between 20 and 35%. The polymerization initiator which can be used for polymerization is not particularly restricted so long as the substance is dissolved in solvent before use, and examples include 2,2'-

azobisisobutylonitrile, 2,2'-azobis(2-methylbutylonitrile), 2,2'-azobis(2,4-dimethylvaleronitrile), 2,2'-azobis(2-amidinopropane) diacetic acid, 2,2'-azobis(N,N'-dime ethyleneisobutylamidine), potassium persulfate, ammonium persulfate, and hydrogen peroxide solution and the like, and the amount used is preferably between 0.02 and 5% of the monomer. The polymerization temperature will vary depending on the polymerization solvent used, but is preferably between 40 and 90°C, and the polymerization time is preferably between 3 and 8 hours.

[0016]
The cationic polymer of the present invention can be used in cleaning agents, cosmetic materials, and softening agents, and the like. The content in the total composition is preferably between 0.001 and 30%, more preferably between 0.05 and 20%, and even more preferably between 0.05 and 10%. If this range is used, the effect had by the cationic copolymer of the present invention can be particularly favorably, and a favorable viscosity will be obtained. The polymer of the present invention can provide even better softening effects, conditioning effects, and finishing feel by blending with an anionic compound. This is thought to be because the cationic polymer and the anionic compound form a complex which provides is very soft and forms a coating on the skin and hair. The blending of the anionic compound can be performed by blending the residual anionic surfactant of a cleaning agent for the case of a finishing agent such as a rinse or a softening agent, or by blending together with the cationic polymer of the present invention during formulation. Examples of the anionic compound are anionic surfactants and water-soluble polymer compounds which have an anion group. A preferable anionic compound is an anionic surfactant.

[0017]
Examples of anionic surfactants include one type or a blend of two or more types of anionic surfactants such as alkyl sulfate, polyoxyethylene alkyl sulfate, alpha-olefin sulfonate, alkyl carboxylate, polyoxyethylene alkyl ether carboxylate, alkylamide ether carboxylate, N-acyl glutamate, N-acyl-N-alkyl-aniline salt, N-acylmethyl taurine salt, N-acyl sarcosate, and alkyl phosphate esters and the like. The alkyl chain of these surfactants preferably has between 6 and 22 carbons, and more preferably between 8 and 18 carbons. Furthermore, the counterion of these salts are monovalent cations, preferably monovalent cations such as sodium, potassium, cesium, and ammonium and the like, and more preferably sodium or potassium salts. With the present invention, the cationic polymer/anionic compound mass ratio is preferably between 0.1/50 and 5/1.

[0018]
The most effective method for using the cationic polymer of the present invention is to apply a composition which is a blend of cationic polymer and anionic compound onto skin or hair, and then rinse with water. Alternatively, the composition of the present invention may be applied to wet skin or hair. With these methods, the complex formed by the cationic polymer and the anionic compound will be soluble in the composition, but will be deposited as a very soft gel on the surface of the skin and hair when diluted with water, and by coating the surface, the particularly excellent effects of the present invention can be achieved. The method of adding the cationic polymer to the aforementioned formulation can be any arbitrary method. Of these, a method of adding a cationic polymer aqueous solution into the product composition is preferable, and depending on the situation, the cationic polymer may be added in the solvent medium used during polymerization of the cationic polymer, or may be diluted with water or the solvent may be replaced with water. For instance, a cleaning agent composition formulated with the cationic polymer of the present invention can be obtained by blending a prescribed amount of a 10% cationic copolymer aqueous solution with an aqueous solution containing a surfactant and other components that was prepared to have a higher solid content concentration than the finished

product, and after forming a uniform aqueous solution, adjusting to the desired product concentration and product pH.

[0019]
Furthermore, a certain amount of amphoteric or nonionic surfactants can also be used in conjunction in an individual anionic surfactant or in a blend of anionic surfactants, to the degree that the anion charge is maintained and formation of a complex is not hindered. Specific examples include any one or a blend of two or more of alkyl acetate betaine, alkylamidopropyl acetate betaine, alkylsulfopropyl betaine, and alkyl alpha-hydroxysulfopropyl betaine, alkylamine oxide, alkylaminopropionic acid, polyoxyethylene (POE) alkyl alkyl ether, alkylmonoethanolamide, alkyldiethanolamide, alkylimidazolium betaine, polyglycerin alkyl ether, alkyl polyglycoside, alkylglyceryl glycoside, POE hardened castor oil, and alpha-alkyl glucoside alkyl ester, and the like. The alkyl chain of these surfactants preferably has between 6 and 22 carbons, more preferably between 8 and 18 carbons. Furthermore, other common cationic or nonionic water-soluble polymers or the like can also be added to the degree that the aforementioned complex formation and the properties of the complex film are not hindered.

[0020]
[Effective the Invention]
The present invention can provide a cationic polymer that can provide excellent softening properties, conditioning properties, and a finished feel to skin, hair, and fibers. In particular, a cationic polymer can be provided which has an excellent conditioning effect during rinsing, which does not become stiff after drying, and which forms a very soft complex film, because the cationic polymer forms a complex with an anionic surfactant which is a cleaning agent component. The present invention will be more specifically described below.

[0021]
[Embodiments]
Embodiment 1
Each of the component monomers shown in Table 1 and 200 g of ethanol were placed in a 1 L 4-opening separable flask equipped with a stirrer, reflux condenser, and nitrogen gas introduction tube, and dissolved until uniform, and then while stirring, nitrogen gas was introduced through the nitrogen gas introduction tube. After 20 minutes, a polymerization initiator solution of 0.8 g of 2,2-azobis(2-methyl-butylonitrile) in 100 g of ethanol was added, and polymerization was performed for 6 hours while supplying nitrogen gas in an oil bath at 90°C. The solvent was then removed from the contents of the flask, and unreacted monomer and odorous residue were removed by dialysis with distilled water, and then the solutions were concentrated and freeze-dried to obtain the cationic copolymers 1 through 10 (present invention polymer No. 1 through 10) .The freeze-dried polymer was dissolved in a solvent medium of 50 mM of lithium chloride in water/methanol = 4/1 (vol/vol), and the molecular weight of the polymer was determined using a water based GPC using this solvent medium as a separating solution, and using a polyacrylic acid with known molecular weight as a standard. The monomer composition used for manufacturing each polymer and the molecular weight and N content (mass%) for each polymer obtained are shown in Table 1.

Comparative example 1
Comparative cationic polymers 1 through 7 (comparative example polymers 1 through 7) were obtained similar to embodiment 1, except that the monomer compositions shown in Table 1 were used. Furthermore, the molecular weight was measured similar to embodiment 1. The monomer composition used for manufacturing each polymer and the molecular weight and N content (mass%) for each polymer obtained are shown in Table 1.

[0022]
Table 1.

	Embodiments										Comparative examples						
Type of monomer	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7
methacrylic acid ethyltrimethyl ammonium chloride	30	50	60	70	80	70	50				5		90			50	
dimethyldiaryl ammonium chloride								50	60	20		5		80	90		40
methoxy POE methacrylate m=2	70						25		20								
methoxy POE methacrylate m=4		50	40					50		80	95	95				50	60
methoxy POE methacrylate m=9				30		10	25		20				10	20			
methoxy POE methacrylate m=23					20	20									10		
N content (wt%)	2	3.4	4	4.7	5.4	4.7	3.4	4.4	3.5	1.7	0.34	0.44	6.1	7	7.9	3.4	3.5
Molecular weight (x10,000)	50	17	10	2	4	7	15	22	15	20	3	15	24	5	50	150	300

[0023]
Embodiment 2
The following model cleaning agent compositions were prepared by adding 0.8% of the cationic polymers prepared in embodiment 1 and comparative example 1.

Model Cleaning Agent Composition	
cationic polymer	0.8%
sodium POE (3) alkyl ether sulfate	10%
alkylamidopropyl acetate betaine	4%
alkyldimethylamine oxide	2%
palm fatty acid diethanaolamide	4%
sodium sulfate	2%
purified water	balance

[0024]
Comparative example 2
Model cleaning agent compositions were prepared similar to embodiment 2, except that the polymer synthesized in comparative example 1 or common cationic polymers shown in Table 2 were used in place of the cationic polymer synthesized in embodiment 1, and the performance was similarly evaluated. The formation of complexes when the compositions of embodiment 2 and comparative example 2 were diluted in water, the conditioning effects, and the softness of the complex film after drying were evaluated by the following methods.

Formation of Complexes
The presence of the deposition of a complex when the model cleaning agent composition was diluted 10 times in water was determined according to the following criteria.
(O): deposition of gel or liquid complex
O: deposition of a gelatinous complex
Δ: deposition of a waxy or plastic complex

X: no deposition of complex

Evaluation of Conditioning Effect
A 10 g bundle of hair was moistened with water, 1 g of model cleaning agent composition was added and made to foam, and rinsed off with 40°C running water, and then the smoothness of the hair bundle, the ease of passing fingers through, and the absense of squeaking hair was evaluated by the following criteria.

(O): Extremely smooth and easy to pass fingers through
O: Smoothness is slightly lower, but no squeaking occurs
Δ: Smooth feel but a sense of rigidity
X: Squeakiness, fingers will not pass through

[0025]
Softness of Film After Complex is Dried
After diluting 10 times in water, the deposited complex was applied to a slide glass, dried, and then rubbed with a finger. The softness and smoothness when touched was evaluated.
(O): smooth very soft film
O: soft film
Δ: film has no flexibility
X: film is hard and brittle

Evaluation of Finishing Feel
The hair bundle used for evaluating conditioning was allowed to sit overnight, and the finish of the hair after drying was evaluated by the following criteria.
(O): finish had a good feel
O: finish had fairly good feel
Δ: no improvement in feel
X: rigid and dry feel
The results are summarized in Table 2.

[0026]
Table 2

	Present invention polymer									
	1	2	3	4	5	6	7	8	9	10
Formation of complex when diluted	(O)	(O)	(O)	(O)	O	O	O	(O)	(O)	O
Conditioning effect	(O)	(O)	(O)	(O)	O	(O)	O	(O)	(O)	O
Softness of dry complex film	O	(O)	(O)	O	O	(O)	O	O	O	O
Finishing feel after dry	O	(O)	(O)	(O)	O	(O)	O	(O)	(O)	O

[0027]
Table 3

	Comparison Polymer							8	9	10	11	12	13	14
	1	2	3	4	5	6	7	cationized cellulose	cationized dextran	cationized guar gum	Mercoat 100	Gufcoat 755	Rubycoat	Cellcoat
Formation of complex when diluted	X	X	Δ	Δ	Δ	O	O	O	O	O	Δ	X	X	O
Conditioning effect	X	X	Δ	Δ	Δ	O	O	(O)	Δ	O	X	X	X	O
Softness of dry complex film	X	X	X	X	X	O	O	X	Δ~X	Δ~X	X	X	X	Δ~X
Finishing feel after dry	X	X	X	X	X	Δ	Δ	Δ	Δ	Δ	X	X	X	Δ

[0028]
From the results of Table 2, it can be seen that the present invention cationic polymers 1 through 10 showed a conditioning effect during rinsing because of the synergistic effect with the anionic surfactant, and could form a complex film which was very soft after drying, and could provide a light and excellent finishing feel. On the other hand, the comparative example cationic polymers 1 and 2 did not form a complex at all, while comparative example cationic polymers 3 through 5 did form a complex, but the feel was hard and the conditioning performance was poor, and this had a major effect on the finish. Furthermore, comparative example cationic polymers 6 and 7 formed a complex which had conditioning properties, but the molecular weight was high, so the amount which adhered to the hair increased and even though a highly soft complex film was formed, in actuality, there was no increase observed in the finishing feel. Furthermore, when a common cationic polymer was used, those with a polysaccharide main chain such as cationized cellulose, cationized dextran, cationized guar gum, and Cellcoat had a relatively good conditioning effect, but the dried film lacked softness, so an improvement in the finishing feel was not observed. On the other hand, commonly used synthetic polymers either failed to deposit a complex, and even if a complex was deposited, the conditioning properties and finishing feel were clearly insufficient. Using the cationic polymer of the present invention which forms a very soft complex as described above, a shampoo, rinse-in-shampoo, body soap, and face soap and the like with excellent conditioning and finishing feel could be prepared.

[0029]
Embodiment 3
Shampoo compositions containing the various cationic polymers were prepared to have a molar ratio of cation groups to anionic surfactant of between 3:1 and 1:3. The composition was as shown in Table 3. The remainder was a 20% ethanol aqueous solution. The softness of the complex which formed after spraying or applying this 20% ethanol aqueous solution was evaluated by the following method. The results are shown together with the composition in Table 3.

Flexibility of Dried Complex Film
A 20% ethanol aqueous solution of the composition shown in Table 3 was sprayed onto a polypropylene plate, and the flexibility was evaluated by the feel when the dried complex film was rubbed with a finger.
(O): smooth with highly soft film
O: soft film
Δ: film lacked flexibility
X: film was hard and brittle

Tight Feel on Hair Bundle
A 20% ethanol aqueous solution of the composition shown in Table 3 was applied to a fixed amount of bundled hair, and the tight feel was evaluated by touch.
(O): light, silky
O: slightly heavier feel than (O)
Δ: even heavier feel
X: tight

Flaking Properties
After evaluating the aforementioned hair bundle by touching, brushing was performed 50 times using a comb, and the occurrence of flaking was evaluated.
O: no flaking
X: flaking

[0030]
Table 4

		Present invention					Comparison example					
		1	2	3	4	5	6	7	8	9	10	11
Cationic polymer	present invention polymer No. 2	0.1	0.5	1	2							
	present invention polymer No. 3					0.1						
	comparative polymer No. 1						0.1					
	comparative polymer No. 3							0.1				
	cationized cellulose								0.1			
	Mercoat 100									0.1		
	Gufcoat 755										0.1	
	Parasusaizu L-440											0.1
Surfactant	sodium POE (3) alkyl ether sulfate		0.5	0.4							0.5	
	palm oil fatty acid-L-glutamate	0.5			0.8	0.5	0.5	0.5	0.5	0.5		0.5
	POE hardened castor oil	0.4		0.5		0.4	0.4	0.4	0.4		0.4	0.4
	polyglycine fatty acid ester		2							2		
Evaluation Results	formation of dry complex film	(O)	(O)	(O)	O	O	Δ	X	Δ	X	X	Δ
	stiffness of hair bundle	O	O	O	O	O	X	X	X	X	X	Δ
	flaking	O	O	O	O	O	O	X	O	X	X	O

[0031]
From the data in Table 3, it can be seen that the cationic polymer of the present invention forms a complex which was very soft compared to any of the commonly used cationic polymers. Using this cationic polymer which formed a very soft complex, hair cosmetic spray, gel, or mousse that does not cause stiffness or flaking and which has a natural touch and an excellent feel during use could be prepared.

[0032]
Embodiment 4
Various compositions containing the cationic polymer of the present invention were prepared. These compositions are shown below.

Shampoo	
sodium POE (3) alkyl ether sulfate	13%
sodium alkyl sulfate	2%
alkylamidopropyl acetate betaine	4%
alkyldimethylamine oxide	2%
POE alkyl ether	1%
palm fatty acid diethanaolamide	4%
present invention polymer No. 2	0.8%
propylene glycol	0.5%
sodium sulfate	1%
ethylene glycol distearate	1.5%
purified water	balance

[0033]

Shampoo	
sodium POE (3) alkyl ether sulfate	4%
lauroyl-N-methyl-β-alanine triethanolamine	5%
cocoylglutamate triethanolamine	5%
alkylamidopropyl betaine	5%
alkyldimethylamine oxide	2%
POE hardened castor oil	2%
fatty acid monoethanolamide	1%
present invention polymer No. 3	0.4%
dipropylene glycol	0.5%
sodium chloride	1%
purified water	balance

[0034]

Rinse-in-shampoo	
sodium POE (3) alkyl ether sulfate	15%
sodium α-olefin sulphonate	5%
alkylamidopropyl betaine	5%
alkyldimethylamine oxide	2%
POE hardened castor oil	4%
fatty acid diethanolamide	5%
glycerin fatty acid ester	5%
present invention polymer No. 2	0.7%
glycerin	1%
sodium sulfate	2%
purified water	balance

[0035]

Body Soap	
potassium laurate	10%
potassium myristate	10%
potassium N-lauroyl-N-methylβalanine	2%

palm oil diethanolamide	3%
ethylene glycol distearate	1.0%
propylene glycol	6%
present invention polymer No. 4	0.1%
potassium chloride	0.1%
purified water	balance

[0036]

Face Soap Cream

lauric acid	2%
myristic acid	18%
palmitic acid	8%
stearic acid	8%
potassium N-lauroyl-N-methylβalanine	3%
monopotassium N-lauroyl glutamate	2%
potassium hydroxide	5.5%
glycerin	15%
PEG400	6%
sorbitol	6%
Present invention polymer No. 8	0.5%
biotic squalane	0.7%
potassium chloride	0.1%
purified water	balance

[0037]

Hair Foam

methyl polysiloxane	5%
POE and POP modified silicone	0.5%
3-methyl-1,3-butadiol	2.0%
present invention polymer No. 3	0.1%
palm oil fatty acid-L-glutamic acid	0.5%
POE hardened castor oil	0.4%
ethanol	20%
liquefied natural gas	7%
purified water	balance

[0038]

Hair Foam

squalane	3%
POE modified silicone	0.5%
3-methyl-1,3-butadiol	2.0%
Present invention polymer No. 9	3%
Chloridated stearyltrimethyl ammonium	0.5%
POE hardened castor oil	0.4%
ethanol	20%
liquefied natural gas	7%
purified water	balance

[0039]
With the aforementioned embodiment, examples of unrestricted components which may be freely added include antistatic agents, dandruff preventing agents, hydrocarbon conditioner agents or emollient agents, fatty acid esters, oils such as silicon, dies, perfumes, organic solvents, pearl glossing agents, foam enhancing agent, additional surfactants, pH adjusting agents, preservatives, protein agents, skin activators, sunscreen, vitamins, viscosity modifying agents, and the like.

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[F terms (reference)]
4C083 AA122 AB032 AB332 AB352 AC012 AC022 AC102 AC122 AC132 AC182 AC242 AC392 AC422 AC432 AC562 AC642 AC662 AC692 AC712 AC782 AC792 AD042 AD131 AD132 AD162 BB34 CC01 CC23 CC38 CC39 DD08 DD23 DD31 EE06 EE07 EE28
4H003 AB27 AB31 AC08 AC13 AC15 AD04 BA12 DA02 EA12 EB04 EB09 EB28 EB30 ED02 FA21 4J002 BG07W BJ00W BQ00X CH05W FD310 GB00 GK02 4J027 AC03 AC06 BA13 BA17 CB02 CB09 CD00 4J100 AL08P AN13P BA08P BA32H BA32P FA03 FA19 FA20 HA31 HC05 HC69 JA11 JA61 4L033 AC02 AC15 CA19